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10/538,414	12/21/2005	Nigel-Philip Cox	2002P17911WOUS	3588

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INTELLECTUAL PROPERTY DEPARTMENT  
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ISELIN, NJ 08830

EXAMINER
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VELASQUEZ, VANESSA T

ART UNIT	PAPER NUMBER
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1793

MAIL DATE	DELIVERY MODE
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04/01/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/538,414	<b>Applicant(s)</b> COX ET AL.	
	<b>Examiner</b> Vanessa Velasquez	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 December 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 26-50 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 26-50 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>June 10, 2005</u>   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Status of Application***

Claims 1-25 are canceled in accordance with the preliminary amendment received June 10, 2005. Claims 26-50 are newly added and are presented for examination.

### ***Priority***

1. Acknowledgment is made of Applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy of patent application no. 02027496.5, filed in the European Patent Office, has been placed of record in the file.

### ***Information Disclosure Statement***

2. One (1) information disclosure statement (IDS) was submitted on June 10, 2005. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Claim Rejections - 35 USC § 112, Second Paragraph***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 28, 39, and 46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding Claim 28, the term "better" is a relative term which renders the claim indefinite. The term "better" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear how and/or to what extent the additional heat treatment improves the microstructure.

Regarding Claim 39, there is insufficient antecedent basis for the term "base metal" in the claim.

Regarding Claim 46, there is insufficient antecedent basis for the term "overaging heat treatment" in the claim. The Examiner will interpret the term "overaging heat treatment" as referring to the improvement heat treatment recited in Claim 26.

### ***Claim Interpretation***

Regarding Claim 39, the Examiner will interpret the phrase "similar analysis" to mean similar composition and/or properties.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 26-30, 33, 35, 37-39, and 43-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vogt et al. (US 6,120,624).

Regarding Claims 26, 33, 37, 38, and 44, US '624 teaches the application of a heat treatment process to nickel-based base superalloys to improve the weldability of said superalloys. More specifically, the process involves heating a nickel-based superalloy above its gamma prime solvus temperature to bring the gamma prime phase

into solution, and then slowly cooling said superalloy to precipitate the gamma prime phase. The gamma prime precipitations are coarsened by the slow cooling stage, forming an overaged structure (US '624, col. 3, lines 35-45).

Still regarding Claim 26 and concerning the cooling rate limitation, US '624 fails to teach the claimed cooling rate. However, it is emphasized that the heat treatment described in US '624 represents time, temperatures, and cooling rates specific to the nickel-based superalloy IN939 (US '624, col. 3, lines 27-32). Thus, it would be obvious to one of ordinary skill in the art to apply a different cooling rate if a different superalloy were employed. Additionally, cooling rate can be appropriately modified to obtain a desired end-result microstructure, as this would require merely routine experimentation by one of ordinary skill in the art. (MPEP § 2144.05 Section II)

Regarding Claim 27, an overaged (coarsened) microstructure results from the cooling step of the preweld heat treatment (US '624, col. 3, lines 35-45).

Regarding Claim 28, the nickel-based superalloy is subjected to additional heat treatment after fusion welding to modify the mechanical properties of said superalloy (US '624, col. 4, lines 14-16).

Regarding Claim 29, the post-weld heat treatment comprises heating the superalloy at a temperature above the gamma prime solvus temperature (US '624, col. 4, lines 14-19) (Note: 2120°F is above the solvus gamma prime solvus temperature – see US '624, col. 3, lines 35-38). Heating above the solvus temperature induces the gamma prime phase to go into solution, thereby partially reversing the coarsening induced by the preweld heat treatment step.

Regarding Claim 30, the nickel-based superalloy IN939 can be investment cast prior to welding (US '624, col. 4, lines 6-9).

Regarding Claim 35, the nickel-based superalloy is heat treated after being cast, and then subsequently repaired via welding (US '624, col. 4, lines 6-9).

Regarding Claim 39, the IN939 material may be repair welded using Nimonic 263, which has a composition similar to IN939. Both alloys include similar proportions of cobalt, chromium, titanium, and aluminum (US '624, col. 4, lines 6-14).

Regarding Claim 43, the exemplary alloy is IN939 (US '624, col. 3, lines 27-32).

Regarding Claim 45, the preweld heat treatment takes place above the gamma prime solvus temperature for a time sufficient to bring the gamma prime phase into solution (US '624, col. 3, lines 35-40).

Regarding Claim 46, the overaging heat treatment takes place above 2100°F (1149°C), which encompasses 1180°C (US '624, col. 3, lines 35-37).

Regarding Claim 47, the heat treatment following welding occurs at 2120°F, which is above the gamma prime solvus temperature (US '624, col. 4, lines 15-21), and therefore, sufficient to bring the gamma prime phase into solution (US '624, col. 3, lines 35-38).

Regarding Claim 48, US '624 is silent as to a specific cooling rate for the post-weld heat treatment. However, it is understood by those of ordinary skill in the art that the cooling rate can be adjusted and will vary depending on the superalloy employed. Additionally, cooling rate can be appropriately modified to obtain a desired end-result

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microstructure, as this would require merely routine experimentation by one of ordinary skill in the art. (MPEP § 2144.05 Section II)

9. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vogt et al. (US 6,120,624), with evidence from Yoshida et al. (US 4,491,001).

Regarding Claim 42, US '624 fails to teach a hammering step after welding. However, imposing mechanical deformation to welded joints is well known in the welding arts, as evidenced by US '001, wherein a welded joint is hammered in order to relieve residual tensile stresses (US '001, col. 2, lines 62-68 to col. 2, lines 1-2). Therefore, it would be obvious to one of ordinary skill in the art to further hammer the weld location because doing so releases internal stresses created during the bonding process.

10. Claims 31, 32, 34, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vogt et al. (US 6,120,624) in view of Schirra et al. (US 5,527,403).

Regarding Claims 31 and 32, US '624 fails to teach a re-densification step. US '403, however, teaches a method of heat treating cast nickel-based superalloys, wherein the method comprises casting the superalloy, re-densifying said superalloy via hot isostatic pressing, and then subjecting said superalloy to heat treatment (US '403, col. 3, lines 13-28; col. 4, lines 24-32). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the re-densification (hot isostatic pressing) step of US '403 into the process of US '624 because densifying a cast alloy



decreases the number of pores, thereby reducing the number of flaws available for crack formation and propagation (US '403, col. 3, lines 25-35).

Regarding Claims 34 and 36, US '403 teaches that a repair process takes place after re-densification and before heat treatment (US '403, col. 3, lines 43-46). However, the repair process is optional, for it is implemented only if defects needing repair are discovered after hot isostatic pressing (US '403, col. 3, lines 45-46). Thus, if no defects requiring repair are found, the step may be eliminated, and heat treatment may proceed immediately after re-densification.

11. Claim 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vogt et al. (US 6,120,624) in view of Schirra et al. (US 5,527,403), with evidence from Hashiguchi (US 2002/0162611).

Regarding Claim 50, US '624 in view of US '403 fail to teach that re-densification occurs at a temperature below the solidus line of the material. However, it is known to the skilled artisan that re-densification processes, such as hot isostatic pressing, typically take place below the solidus temperature of an alloy to prevent shape distortion of the alloy during casting, as evidenced by US '611 (see para. [0030]).

12. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vogt et al. (US 6,120,624) in view of Heitman et al. (US 5,071,059).

Regarding Claim 40, US '624 teaches that the weld filler may be of a material similar to the alloys to be welded, but fails to explicitly teach that the filler may be of the

same material as the alloys being welded. US '059 teaches a method for welding nickel-based superalloys, wherein the filler material is preferably identical in chemical composition to the alloys being welded (US '059, col. 3, lines 62-68). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a filler material identical to the nickel base superalloys being welded in US '624 because doing so would eliminate the possibility of forming an alloy with inferior mechanical properties in the heat-affected zone.

Regarding Claim 41, US '059 teaches that it is preferable for the weld filler to be of the same composition as the workpieces being welded (US '059, col. 3, lines 62-68). Thus, in the case the workpieces are superalloys, the weld filler would also be a superalloy, and because superalloys are capable of being precipitation hardened, the weld filler material must also necessarily be capable of being precipitation hardened.

13. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vogt et al. (US 6,120,624) in view of Heitman et al. (US 5,071,059), with evidence from Schweizer et al. (US 4,222,794).

Regarding Claim 49, US '624 in view of US '059 does not teach a particular volume percent of precipitations of the weld filler. However, it is not unusual for the amount of gamma prime phase precipitates in nickel-based superalloys to be up to 60 percent by volume, which overlaps the claimed range, as evidenced by US '794 (col. 2, lines 8-10). Thus, it would be obvious to one of ordinary skill in the art at the time of the invention to ensure that the precipitations in the weld filler amount to at least 35 vol.%

because the presence of a relatively large volume of precipitates would strengthen the joint at which the two superalloys are welded.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Velasquez whose telephone number is (571)270-3587. The examiner can normally be reached on Monday-Friday 8:30 AM-6:00 PM ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached at 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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